

REMARKS

Claims 7, 9-11 and 18-20 are all the claims pending in the application. Claims 1-5, 8 and 12-17 remain withdrawn from consideration. Claim 7 is amended to recite "...wherein the diffusion prevention layer comprises a nickel-rhenium-phosphorus plating film". Claim 18 is amended to delete reference to tungsten. No new matter is added. Entry is respectfully requested.

I. Rejections under 35 U.S.C. § 103(a)

On page 2 of the Office Action, claims 7, 9 and 18-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee (U.S. Patent No. 6,180,523) in view of Sambucetti et al (U.S. Patent No. 6,335,104). The Office Action takes the position that Lee discloses each feature of instant claims 7, 9, 18 and 19, except for the first barrier layer, which is allegedly disclosed in Sambucetti et al. It thus allegedly would have been obvious to have used Sambucetti et al's diffusion prevention film in Lee in order to prevent the first Cu layer from diffusing, since Sambucetti et al discloses a film suitable for preventing Cu from diffusion.

The Office Action rejects claims 9-11 under 35 U.S.C. § 103(a) as being unpatentable over Lee in view of Sambucetti et al, further in view of Neary (U.S. Patent No. 4,424,805) and Vullaume et al. (Applied Physics Letters, volume 69, pages 1646-1648 (1996)), as described by Wada et al (U.S. Patent Appln. Pub. No. 2005/0056828); and rejects claim 18 under 35 U.S.C. § 103(a) as being unpatentable over Lee in view of Sambucetti et al, further in view of Silwa (U.S. Patent No. 4,990,462).

The Office Action takes the position that Lee et al teaches that their invention discloses a technique of utilizing electroless deposition in ULSI circuits. The Office Action further asserts

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
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that this metallization process is an additive and selective to provide conducting layers as well as an interconnection between layers of a multilevel conductive metal semiconductive device (see column 10, lines 60-62; Abstract; column 5, lines 41-45; and column 2, lines 9-12).

Applicants respectfully traverse the rejection.

Amended claim 7, from which claim 9-11 and 18-19 depend, recites in pertinent part "...diffusion prevention layer comprises a nickel-rhenium-phosphorus plating film". Lee and Sambucetti et al. neither disclose nor suggest that a nickel-rhenium-phosphorus plating film is used for the diffusion prevention layer.

Rather, Sambucetti et al. discloses on column 4, lines 8 to 13 that rhenium nanoparticles may be employed as a nucleation layer in between a copper pad and a diffusion protection layer. In Sambucetti et al., the rhenium nanoparticles may thus be contained partially in a surface of the diffusion protection layer, but do not act as the diffusion protection layer by themselves alone. In other words, the rhenium nanoparticles described in Sambucetti et al. do not serve as the diffusion protection layer by forming an alloy together with any other components.

Further, Sambucetti et al. discloses on column 6, lines 14 to 18, that a dual layer (20) of the protection layer includes a first diffusion barrier layer (16) (e.g., Ni-P, Co-W-P, Co-Sn-P, Ni-W-P, Co-B, Co-Sn-B, Co-W-B,) and a second adhesion layer (18) (e.g., Au). That is, the dual layer (20) serves not only to prevent copper from diffusing into a soldering metal, but also to provide copper protection and reliable wire bond structure.

In contrast, the claimed invention prevents copper from diffusing into the insulating layer of SiO₂ by only a single diffusion prevention layer. Thus, the claimed diffusion prevention layer is different from the dual layer of Sambucetti et al. in both composition and function.

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None of Lee, Neary, Vullaume et al., Silwa nor Wada et al. are cited for, nor disclose, a remedy for the deficiencies of Sambucetti et al.

Accordingly, the features of claim 7, from which claim 9-11 and 18-20 depend, would not have been obvious over any combination of Sambucetti et al., Lee, Neary, Vullaume et al., Silwa and Wada et al.

Withdrawal of the rejection and immediate allowance of all pending claims are earnestly solicited.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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
WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: September 26, 2008

Respectfully submitted,



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